4.4 A BRUSH AND FOREST FIRE CLIMATOLOGY FOR MASSACHUSETTS AND RHODE ISLAND: RESULTS FROM 1964-2000

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1. INTRODUCTION

The WFO Taunton County Warning Area (CWA) extends from the eastern slopes of the Berkshires and Monadnocks of western Massachusetts to the coastal plain of southeast New England. The region is largely forested with a very unique and extensive urban/woodland interface. This unique interface can pose a significant danger to life and property in the event of even relatively small brush or forest fires.

This paper will provide a climatology of brush and forest fires across Massachusetts and Rhode Island since 1964. This climatology will address monthly and annual variations as well as the relationship to monthly and annual precipitation across the region.

2. MASSACHUSETTS AND RHODE ISLAND FOREST FIRE REGION

The National Weather Service Forecast Office, in Taunton, MA, has a very wide range of vegetation and soil conditions within it's CWA. Vegetation varies from predominantly hard woods of oak and maple over interior Massachusetts and Rhode Island to mostly pine forests across southern Rhode Island and southeast Massachusetts. Along the immediate coastline of Massachusetts and Rhode Island, large areas of salt marshes provide their own unique form of fuels for wildland fires.

With regard to vegetation growth, the region typically experiences a change from dormancy to increased growth, sometimes referred to as the green-up period, from March into May. Similarly, the region typically experiences a rapid return to dormancy in vegetation during October and November.

3. DATA SOURCES

Both the Massachusetts Department of Environmental Management Fire Control Division (MADEM Fire Control) and the Rhode Island Division of Forestry (RIDF) maintain monthly records of the numbers of all wildland fires within their respective states since the early 1960s. This study has examined the period 1964-2000, with the exception of the year 1990 for which data was unavailable from both the MADEM and RIDF.

Monthly precipitation totals were obtained from four National Weather Service observing locations. These were Boston's Logan Airport, T.F.Green Airport in Warwick RI, Worcester Airport in Worcester MA and Bradley International Airport in Windsor Locks CT. These sites were chosen due to their long period of record and for being representative of precipitation across the region on a monthly basis.

4. METHODOLOGY

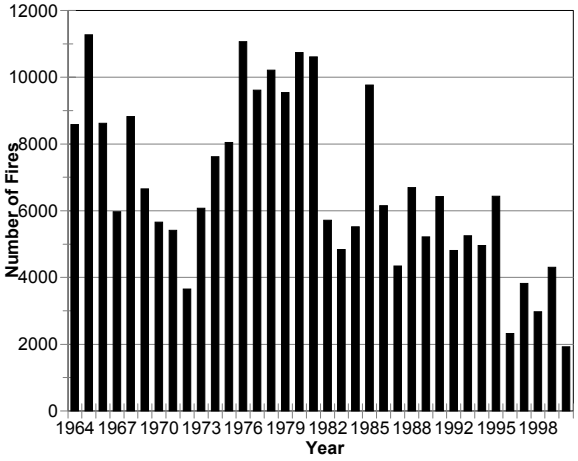
For this study, a fire was classified as any woods, grass, or brush related fire, regardless of size, which was reported to either MADEM Fire Control or to RIDF. The decision to include all fires, even those of a quarter of an acre or less, was made due to the extensive woodland/urban interface found throughout Massachusetts and Rhode Island. Monthly and annual precipitation data from the four NWS sites were averaged to compute normal monthly and annual precipitation for the region as a whole. This allowed for a comparison of both fire frequency as well as fire frequency and observed precipitation.

5. BRUSH AND FOREST FIRE CLIMATOLOGY

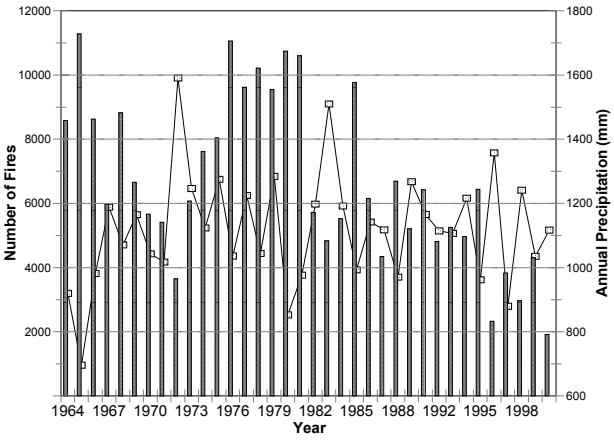
The following subsections provide a summary of average monthly fire distribution for Massachusetts and Rhode Island since 1964, excluding 1990 for which fire data was unavailable. A comparison of fire frequency with rainfall is also provided.

5.1 Annual Distribution

Figure 1 provides an annual fire distribution for the period of study. The average annual number of fires was 6,600. There were two maxima of activity, noted in the mid 1960s and again in the 1970s. There was also one very pronounced period of inactivity, occurring from 1996 through 2000.



A comparison of fire distribution with annual precipitation is provided in Figure 2. The majority of above normal fire years did tend to correlate with years of normal to below normal precipitation. Similarly, years of below normal fire years did tend to correlate with years of above normal precipitation.



5.2 Monthly Distribution

Figure 3 provides the average monthly distribution of fires for the study period. Note the marked peak in activity during the critical spring green-up period from March through May. There is a somewhat less dramatic increase in activity in October, related to the seasonal return to dormancy in the vegetation.

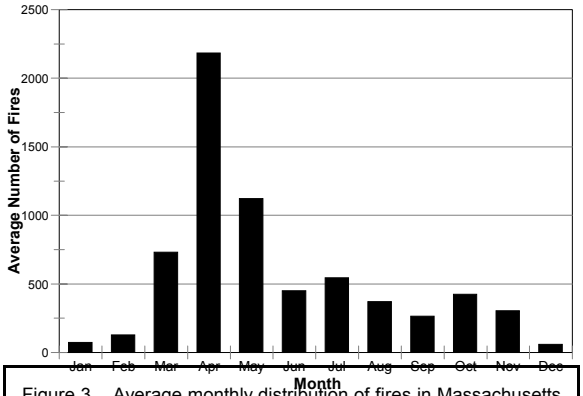


Figure 3. Average monthly distribution of fires in Massachusetts and Rhode Island, 1964-2000.

5.3 Variations Within Months During Green-Up

An examination into the months during the green-up which experienced the greatest frequency of fires shows a similar pattern to the annual fire frequency. Figures 4 and 5 provide the annual distribution of fires over the study period for March and April, respectively.

Both months exhibit a similar variation year by year, but April appears to more closely resemble the annual distribution of fires, with above normal periods in the mid 1960s and 1970s, and the marked inactive period since the mid 1990s.

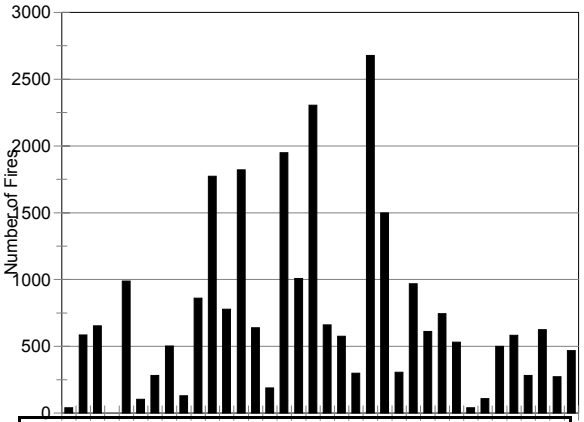


Figure 4. Fire distribution for March in Massachusetts and Rhode Island, 1964-2000.

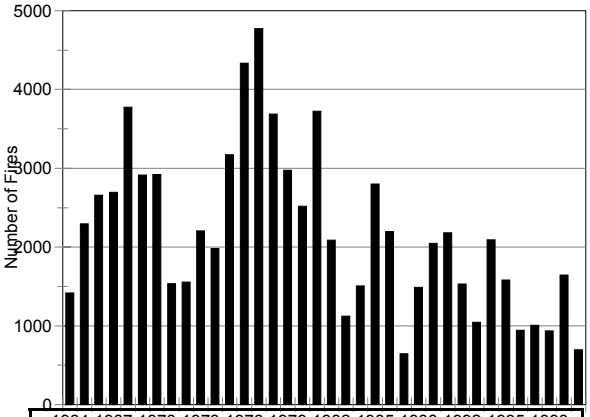


Figure 5. Fire distribution for April in Massachusetts and Rhode Island, 1964-2000.

Figures 6 and 7 provide a comparison of fire frequency to rainfall for March and April, respectively.

Both March and April exhibited a tendency for the

most active fire periods to correlate with below normal precipitation, though not every month with below normal precipitation experienced above normal fires. Similarly, those very inactive seasons tended to correlate with months of above normal precipitation.

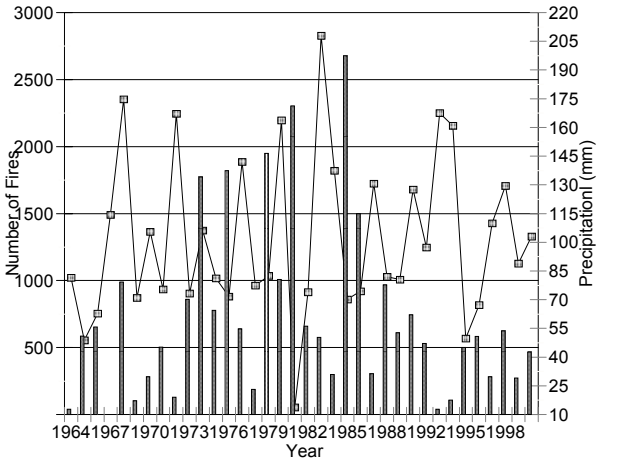


Figure 6. Comparison of fire distribution (bar graphs) and precipitation (solid line) for March in Massachusetts and Rhode Island, 1964-2000.

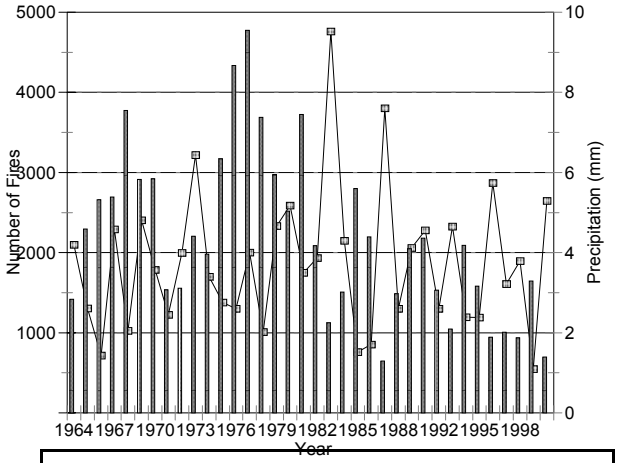


Figure 7. Comparison of fire distribution (bar graphs) and precipitation (solid line) for April in Massachusetts and Rhode Island, 1964-2000.

5.4 Variations Within Months During Return to Fall Dormancy

The relationship to fire frequency and precipitation is quite weak during the period of time when the vegetation returns to dormancy. Figure 8 provides the fire frequency and rainfall for October for the period of study. Active fire years occurred during periods of both below and above normal monthly precipitation during October.

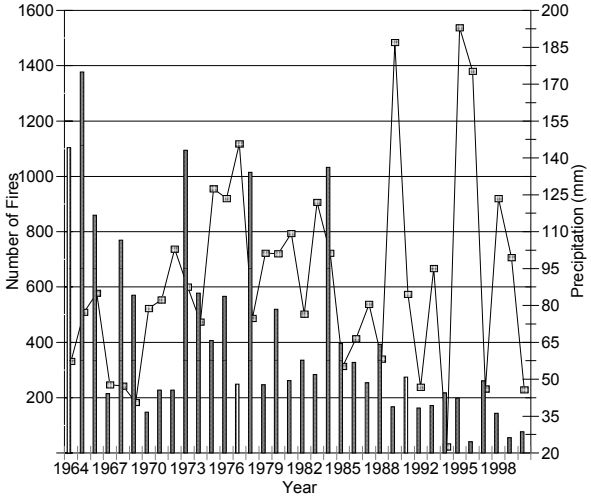


Figure 8. Comparison of fire distribution (bar graphs) and precipitation (solid line) for October in Massachusetts and Rhode Island, 1964-2000.

6. CONCLUSION

Brush and forest fires in Massachusetts and Rhode Island can occur throughout the year. The time of greatest frequency is related to the springtime when the vegetation is leaving dormancy and enter the green-up period. During this time, the majority of active seasons did occur when precipitation was below normal, on both an annual and monthly basis.

Further research is planned and will examine the prevailing synoptic scale pattern over the region during the most active fire periods as well as subdividing events based on fire size, data which was not readily available at the time of this study.

7. REFERENCES

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